

Final 1/29/15

MISSOURI CONSERVATION HERITAGE FOUNDATION  
STREAM STEWARDSHIP TRUST FUND – GRANT PROGRAM  
**REQUEST FOR MITIGATION PLAN APPROVAL**

The Stream Stewardship Trust Fund is available to restore, enhance, and/or protect stream systems and associated riparian habitats. Proposed projects will be prioritized and funded by the Foundation based on regional stream needs, maximum return on expended monies, level of threat to the stream system, and overall anticipated benefits to stream resources. Proposed projects should be located within the ecological drainage unit (EDU) where participating stream impacts occurred. Approval will be limited to projects that restore, enhance, or preserve Missouri's diverse stream systems.

This request form will be used by MCHF Board members assigned to the Stream Stewardship Trust Fund – Grant Program Action Team. Proposals submitted for funding consideration need to clearly explain elements of stream-based projects listed below which warrant consideration during the approval process. Spaces provided in the elements below are not to be considered limiting, and the attachment of additional pages of explanation is encouraged in order to provide full details.

*The Goal of the MCHF's Stream Stewardship Trust Fund is to provide an innovative tool for the restoration, enhancement, and protection of Missouri's streams and aquatic resources.*

1) Project Title Richland Creek Stream Bank Stabilization Project

Landowner Name [REDACTED]

2) County Morgan MDC region Central

3) Project objectives – We are proposing this mitigation project because...

This project will provide rock-based stabilization on approximately 550 feet of stream bank that has seen large changes over the past twenty years allowing large amounts of sediment to enter Richland Creek and eventually the Lamine River. Reduction of sediment inputs will improve aquatic habitats and water quality. This project will also provide about nine acres (approx. 0.75 miles) of stream bank to be placed into a perpetual conservation easement.

These objectives will all address specific areas of concern discussed in the Compensation Planning Framework for the Blackwater/Lamine Rivers EDU.

This project would address the aquatic resource issue of stream bank erosion as an unintended adverse effect due to inadequately-sized vegetated riparian corridors, channel alterations, row cropping in the Osage Plains sections of the watershed, grazing, and destruction of riparian vegetation from construction, livestock use and row crop agricultural activities. This project would address water quality issues outlined in the compensation planning framework by reducing soil, stream bank and streambed erosion that contributes excessive sediment to the stream especially in areas of inadequately-sized vegetated riparian corridors.

This project would maintain and expand vegetated riparian corridors, improve in-stream habitat and stabilize stream banks. This project also would increase landowner awareness of local stream resources and good watershed and stream management practices. This site could also be used as a stream management demonstration site, and it would improve landowner stewardship of streams by promoting and implementing cost share programs.

This project will provide additional nutrient filtering through the establishment of 550 linear feet of new riparian corridor and the long-term protection and enhancement of an additional 3,550 feet of existing riparian corridor. The project and riparian corridor is all adjacent to cropland which makes up 32% of the Richland Creek watershed and is its chief source of sediment input.

The middle reach of the Richland Creek watershed will be used as a reference reach to gauge the effectiveness of this project. The middle of the Richland Creek watershed is identified as a Aquatic Conservation Opportunity Area that is a good example of a high quality stream with good wooded corridors and limited erosion.

- 4) The project submitted for consideration is in the Richland Creek watershed and is considered a priority by MDC for the following reasons (include how project achieves watershed objectives and describe the rationale for site selection).

The upper and middle portion of Richland Creek is an Aquatic Conservation Opportunity Area (ACOA) for the Missouri Department of Conservation. This particular site is downstream of the Richland Creek ACOA, however, the goals of this project align with the goals of the ACOA by reducing soil erosion through stream bank stabilization and protection of good quality existing habitats and riparian corridors through conservation easements. Completion of this project will result in the stabilization of a stream bank that has been eroding greatly over the past two decades and it will reduce soil inputs from bottomland erosion in the adjacent crop field. This is especially beneficial because row crop erosion in this watershed has been given a high ranking at 9-13 tons of soil loss per acre.

- 5) Site protection instrument (circle):

Acquisition      Perpetual easement      Special management agreement

- 6) Describe the details of the site protection instrument (ownership, legal arrangements, how the instrument assures the long term protection of the proposed mitigation site):

The landowner specified on the deed will be verified in addition to verification of any rights granted on the property. A permanent easement will be established for the entire stream length on the property and the stream bank stabilization project will be protected under a Compensatory



Mitigation Project Agreement with the landowners. The perpetual easement will be written into the deed of the property to stay in trees and vegetation even in the instance of land transferring hands. If any alterations are proposed for the protected area, a professionally trained forester, engineer, and/or hydrologist will need to approve those alterations prior to implementation.

7) Baseline information

- a. Describe the ecological characteristics of the proposed project site:

The project site is located on Richland Creek at approximately river mile 2.6 from the confluence of Flat Creek to form the Lamine River. The eroding bank and adjacent riparian corridor are on the right descending bank which is an outside bend in the stream. At this site, Richland Creek is a 4<sup>th</sup> order stream with a watershed of approximately 90 square miles, the entire Richland Creek watershed is 137 square miles. Since 1995, the bank has experienced accelerated bank erosion, moving over 150 feet with bank heights of 10-17 feet and a bank slope greater than 1:1. The land adjacent to the eroding stream bank is lacking a riparian corridor and row crops are planted up to the stream bank. There is a gravel point bar on the opposite bank along with a stream bottom mostly comprised of gravel and cobble. The site is approximately 550 feet long with the stream bank comprised of a top layer of soil with the lower layer being a combination of highly erosive gravel, sand, and some clay. The primary cause of erosion is the undercutting of the toe.

- b. Historic and existing plant communities, hydrology and soils of the proposed project site:

This area was predominantly forest, with Sturkie silt loam (75378) soils with underlying primary dolomite and secondary sandstone geology. This area generally has 0 to 2 percent slopes and is frequently flooded. Current land use is row crops (no riparian corridor) with fair to good riparian corridor upstream and downstream of the project site.

- c. Project application must include maps identifying the proposed project boundary with lat/long boundaries in decimal degrees and a GIS shape file with metadata of the delineated boundary.

See attached figures for project locations and details.

- d. Describe existing hydro-system connectivity between the stream project site and any wetlands or other waters including tributaries connecting to receiving waters:

Richland Creek is a fourth order stream at the project site and has the third order Gabriel Creek entering about 200 feet below the project site. One first order tributary enters about 2000 feet above the project site. There was an Inland Forested Wetland connecting to this site, but it has been mostly eliminated due to lateral stream bank erosion.

8) Determination of credits as determined by the Missouri Mitigation Method (attach credit calculation worksheet or other detailed information to demonstrate the specific approach for credit calculation for this project):

- a. Number of stream channel credits 1375
- b. Number of riparian credits 4754
- c. Stream type (circle): Ephemeral      Intermittent      Perennial

9) Mitigation work plan

- a. Specifications of the project (geographic boundaries, construction methods, timing, sequence:  
The rock stabilization project will employ three, thirty foot long bendway weirs that will be keyed into the bed of the stream as well as into the stream bank. These weirs will be placed at a 5-25 degree angle upstream in order to redirect flow away from the toe of the stream bank to reduce erosion. For the number of weirs, size, and amount please see the attached engineering design. In addition to the weirs this project will also include 275 feet of toe rock downstream of the three weirs. The establishment of a riparian corridor will use either hand planting or a mechanical tree planter. The plantings will be done once rock placement is completed and will include species recommended by a local forester. Plantings will be maintained throughout the monitoring period.
- b. Methods for establishing desired plant community (species composition and type, control of undesirable species, size of plants used, control of wildlife damage): An MDC approved tree and shrub planting plan will be given to the landowner for guidance in restoring and enhancing the riparian corridor (see attached example).
- c. Grading plan and elevations of constructed features (describe or attach engineering design plans): see attached design  
\_\_\_\_\_  
\_\_\_\_\_
- d. Describe or attach drawings showing existing stream channel cross sections, proposed alterations to the stream channel and/or banks, a description of in-stream structures including materials used for improvements, dimensions and elevations, and riparian plantings: see attached design  
\_\_\_\_\_  
\_\_\_\_\_

10) Maintenance plan:

- a. Description and schedule of maintenance following initial construction:  
Depending on initial construction time of year, trees will be planted in the spring following construction. A tree planting plan will be used for guidance and the maintenance guidelines will be followed for a successful riparian corridor establishment. Planting sites will be prepared by using an approved herbicide in the fall and also in the spring to kill fescue and other vegetation. In the spring, a pre-emergent herbicide will be applied to help control unwanted vegetation through the summer.
- b. Mowing frequency and timing:



Mowing of weeds between rows of newly planted trees will be beneficial in aiding in tree survival and growth. This will be done as needed until the newly planted trees are taller than any potential weed growth.

- c. Herbicide applications (chemical used, method, timing, frequency):

Prepare the planting site by one or more of the following methods: Plow, disc, till, or herbicide a narrow strip (3 to 4 feet) or the whole area where seedlings are to be planted to obtain bare soil. Any type of herbicide with an active ingredient that contains glyphosate can be applied (ex. Roundup, Roundup Ultra, ClearOut, Eraser, Buccaneer, Gly-4(plus)) in the fall and also in the spring to kill fescue and other vegetation. In the spring before tree seedlings break dormancy a pre-emergent herbicide will be used to help control unwanted vegetation through the summer. Stomp, Prowl, Goal, Oust, Squadron or Princep 4L are several types of pre-emergent herbicides that can be used. To control annual and perennial grasses (fescue, foxtail, and Johnson grass) during the growing season use Poast, Fusilade, or Select herbicides. These chemicals can be sprayed over the top of actively growing broadleaf trees.

- d. Irrigation plan (include source of water): No irrigation provided.

- e. Passive water control and instream structure description and required maintenance (type and frequency):

The rock stabilization project will employ three, thirty foot long bendway weirs that will be keyed into the bed of the stream as well as into the stream bank. These weirs will be placed at a 5-25 degree angle upstream in order to redirect flow away from the toe of the stream bank to reduce erosion. For the number of weirs, size, and amount please see the attached engineering design. In addition to the weirs this project will also include 275 feet of toe rock downstream of the three weirs. No maintenance required. See adaptive management section for instream structure failures.

#### 11) Performance standards

- a. Description of the performance standards used (include metrics for determining project success):

Riparian: Monitoring will take place for five years to ensure that performance standards will follow Natural Resource Conservation Service, Conservation Reserve Program CP-22 specifications of 350 stems/acre after the second growing season including natural recruitment of native desirable species. Monitoring, for purposes of the easement, will continue in perpetuity.

Stream Channel: We will be using georeferenced aerial photography to monitor lateral bank movement; the erosion rate of the mitigation channel reach should be less than or equal to the reference reach. We will monitor the site to ensure that the structures are working as designed and remain in place. After several high flow events, we would expect to see the thalweg of the stream shift away from the eroding bank and the bank begin to stabilize as erosive forces are diverted and riparian growth becomes established.

Reference stream(s) used (if any): Upper and middle reaches of the Richland Creek watershed.

- b. Describe how the performance standards relate to the objectives of the mitigation site (include description of the desired resource type, expected functions or services being measured, or any other applicable metrics): By monitoring lateral bank movement, we will be able to determine if this accelerated bank erosion has been reduced thus reducing the increased sediment loads into the stream. By following the specifications for a newly established riparian corridor, we are confident that it will improve the stream corridor condition and bank stability in the project area.
- 12) Describe the method and frequency of project monitoring to determine when performance standards are being met (project site must be monitored for an appropriate period not less than 5 years after initial construction/planting), who will be conducting the monitoring, and the frequency monitoring reports will be submitted: MDC/MCHF staff will photo document changes in stream channel morphology and will also photo document rock stabilization structures and riparian corridor restoration/enhancement. Lateral channel migration will be measured using aerial photography along the project site and newly restored/enhanced riparian corridor every year for five years. After the five years, the site will be visited periodically until it is determined the establishment is successful.
- 13) Long-term management plan:
  - a. Describe how the project site will be managed after performance standards have been met: The project site will be protected by a perpetual easement and monitored routinely, understanding that some changes will occur as it stabilizes. Continuing evaluations and coordination will take place with the USACE. If any adverse effects occur they will be addressed on a case-by-case basis with Best Management Practices (BMPs) that have been approved throughout Missouri for use on stream and riparian corridors. In addition, the landowner envisions improving the riparian corridor for wildlife.
  - b. Annual cost estimate for management: \$ 60-\$100/ acre
  - c. Funding mechanisms will be used to finance long term management (including responsible party): If required SSTF funds will be used to make sure the newly established riparian corridor is successfully established and maintained.
  - d. Long term management responsibilities transferred to (include description of their long term management plan and a written stewardship commitment that includes a financing plan): The landowner will assume responsibility for long-term management of the project. Through MDC technical assistance, the landowner will have guidelines to ensure a successful project. A perpetual easement will ensure that the project will stay protected into perpetuity.
- 14) Adaptive management plan (due to inability to construct project in accordance with approved plans, monitoring revealing that the project is not meeting performance standards, remedial measures resulting in project modifications, design changes, revisions to maintenance requirements, revised monitoring, etc); continual monitoring will occur and any necessary coordination will take place with the COE:



- a. Description of strategy to address unforeseen changes in the project: If rock stabilization fails, MDC will reevaluate and reconstruct rock stabilization to specifications for a successful design. If the riparian corridor does not meet performance standards identified in Section 11a, then the landowner will be required to re-plant. If the riparian corridor fails due to an act of God, then SSTF funds will be used to assist with a new planting.
- b. Party (ies) responsible for implementing adaptive management: If failure in the project is due to an act of God, the agencies will assist with an adaptive management plan. If failure is due to landowner negligence, then the landowner will be responsible for preparing an adaptive management plan (approved by the agencies) and implementing remedial measures.

15) Financial Assurances:

The MCHF has previously demonstrated its ability to fund good stream projects and is committed to the installation, monitoring, and long term management of its compensatory mitigation projects. Since an important basis for project selection is a project's fit into MDC's statewide stream management plan, a commitment of the biological, engineering, and legal resources of MDC also accompanies each project. In addition to MDC's support, the MCHF has incorporated financial assurances into its cost-per-credit and will retain financial assurances not to exceed 10% of each project's estimated completion cost to establish a continuous contingency fund balance of \$250,000.00.

16) Total cost of the project is estimated at \$44,250. SSTF Resources are requested in the amount of \$ 39,250.

17) Partner funds in the amount of \$ 5,000.00 are being contributed by: (if applicable): Morgan County Soil and Water District

18) Total stream length of the project 4100 feet or 0.78 miles Total Riparian corridor acreage 9 acres.

19) Total cost per credit (including all costs) estimated at \$ 5.23.

20) If the project is leveraged with contributions from others, SSTF Resources are requested to fund which practices/products/costs activities? Purchase of rip-rap rock, installation and equipment costs, survey and easement work and easement payment, and tree purchase and planting costs.

21) Schedule for project completion and/or installation: Rock stabilization to begin Summer 2015; Riparian Corridor Restoration/Enhancement Spring 2016; Final Project completion Fall 2016.

Note: Proposal must include appropriate on-site photographs, county maps locating the proposed project, related topographic, soils, or other maps, drawings and materials necessary to describe planned activities. In order to reproduce color photographs and maps, a complete electronic file is requested with project proposals.

### IN-STREAM WORKSHEET

Stream Type	Ephemeral 0.15	Intermittent 0.2	Perennial Stream 0.4	
Priority Waters	Tertiary 0.05		Secondary 0.2	Primary 0.4
Net Benefit	Stream Relocation to Accommodate Authorized Project 0.5		Moderate 1.2	Good 2.4 Excellent 3.5
Site Protection	Corps approved site protection without third party grantee 0.1		Corps approved site protection recorded with third party grantee, or transfer of title to a conservancy 0.4	
Credit Schedule	Schedule 1 0.3		Schedule 2 0.1	Schedule 3 0

Factors	Net Benefit 1	Net Benefit 2	Net Benefit 3	Net Benefit 4	Net Benefit 5	Net Benefit 6
Stream Type	0.4					
Priority Waters	0.2					
Net Benefit	1.2					
Site Protection	0.4					
Credit Schedule	0.3					
Sum Factors (M)=	2.5					
Stream Length Benefited (do not count each bank separately or count same channel reach twice) (LF)=	550					
Credits (C) = M X LF	1375					
Total Instream Credits Generated C X LK Factor* =	—					

Total Instream Credits Generated from all Columns = 1375

\* Location and Kind (LK) Factor only applies to permittee-responsible mitigation projects  
(see page 18 of document).

Credits in this EOU are  
treated as released as  
approved in our SSTF instrument.



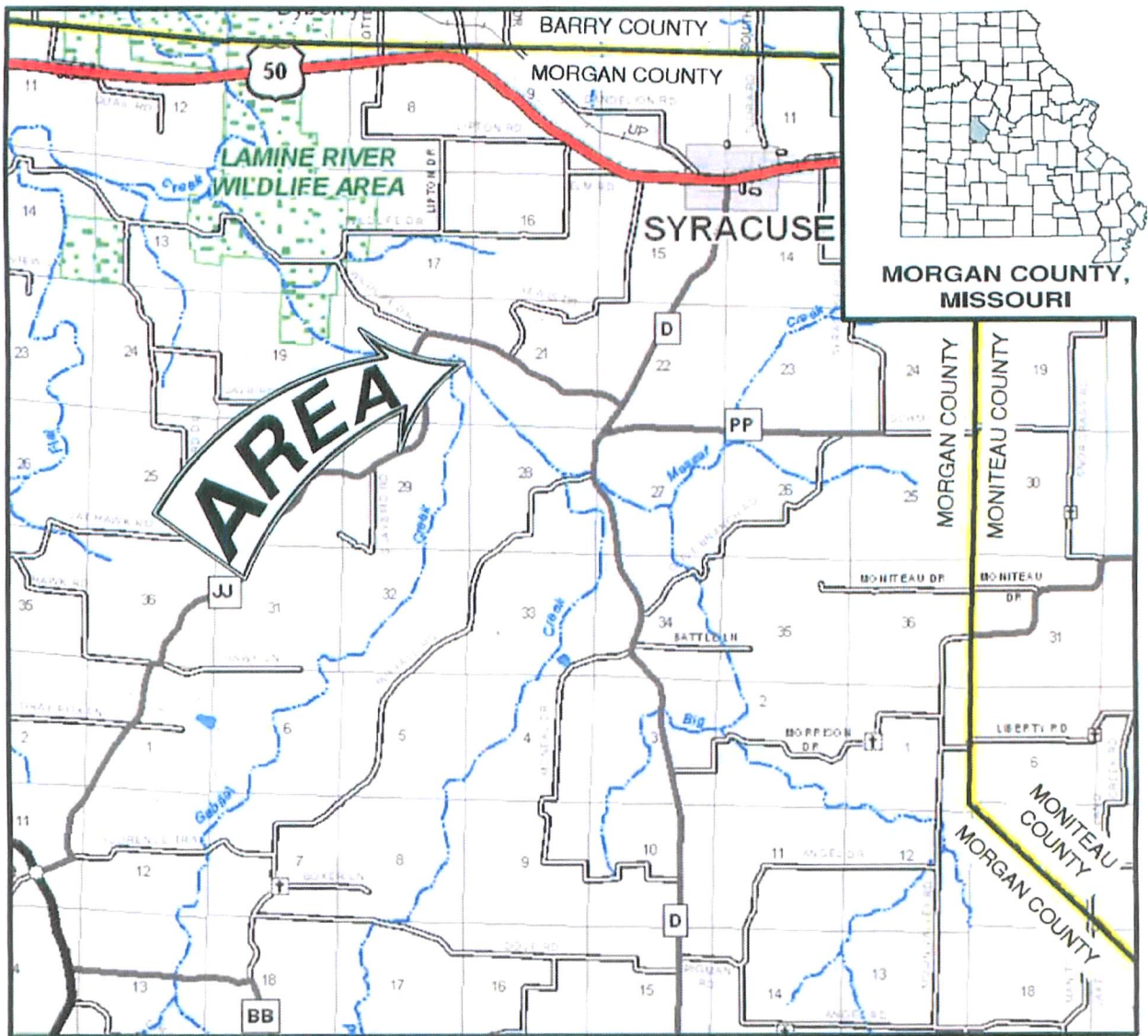
### RIPARIAN BUFFER WORKSHEET

Stream Type	Ephemeral 0.15	Intermittent 0.2	Perennial 0.4
Priority Waters	Tertiary 0.05	Secondary 0.2	Primary 0.4
Net Benefit (for each side of stream)	Riparian Restoration/Establishment, Enhancement, and Preservation Factors (select values from Table 1) (also see Minimum Buffer Width (MBW) page 15)		
Supplemental Buffer Credit	Condition: Buffer established, enhanced or preserved on both streambanks To calculate: (Net Benefit Stream Side A + Net Benefit Stream Side B) / 2		
Site Protection	Corps approved site protection without third party grantee 0.05	Corps approved site protection recorded with third party grantee, or transfer of title to a conservancy 0.2	
Credit Schedule	Schedule 1 0.15	Schedule 2 0.05	Schedule 3 0
Temporal Lag (Years)	Over 20 -0.3	10 to 20 -0.2	5 to 10 -0.1
			0 to 5 0

Factors	Net Benefit 1	Net Benefit 2	Net Benefit 3	Net Benefit 4	Net Benefit 5	Net Benefit 6
Stream Type	0.4	0.4				
Priority Waters	0.2	0.2				
Net Benefit	Stream Side A	0.18	0.7			
	Stream Side B					
Supplemental Buffer Credit (Buffer on both sides)						
Site Protection	0.2	0.2				
Credit Schedule	Stream Side A	0.15	0.15			
	Stream Side B					
Temporal Lag	0	-0.3				
Sum Factors (M)=	1.13	1.35				
Linear Feet of Stream Buffered (LF)= (do not count each bank separately or count same channel segment twice)	3550	550				
Credits (C) = M X LF	4011.5	742.5				
Total Credits Generated C X LK Factor * =						

Total Riparian Credits Generated from all Columns = 4754

\* Location and Kind (LK) Factor only applies to permittee-responsible mitigation projects (see page 18 of document).



## VICINITY MAP

### DESIGN AND DEVELOPMENT

MISSOURI DEPARTMENT OF CONSERVATION



P.O. BOX 180, JEFFERSON CITY, MO 65102  
(573) 522-4115 www.mdc.mo.gov

CENTRAL REGION PRIVATE  
LAND - GENERAL

STREAMBANK STABILIZATION

- PRELIMINARY -

DATE 10/06/14  
DRAWN RDI

DESIGN LAM  
CHECKED



### DESIGN AND DEVELOPMENT

MISSOURI DEPARTMENT OF CONSERVATION

P.O. BOX 180, JEFFERSON CITY, MO 65102 (573) 522-4115

VICINITY MAP

PROJECT NO.

42-43-00

C-001

SHEET

1

OF

5



Figure 3: Richland Creek Channel Migration Map

## Richland Creek, Morgan County

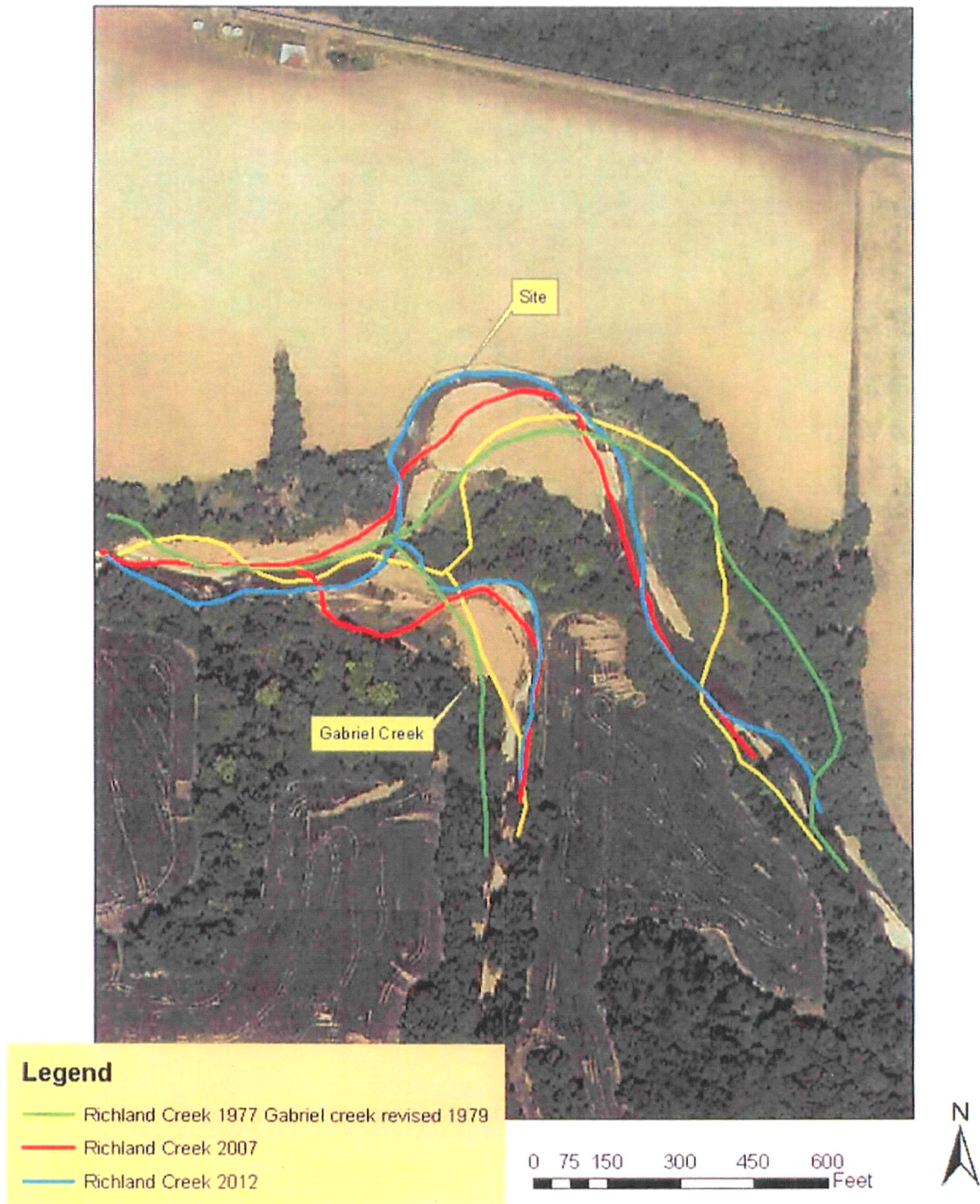
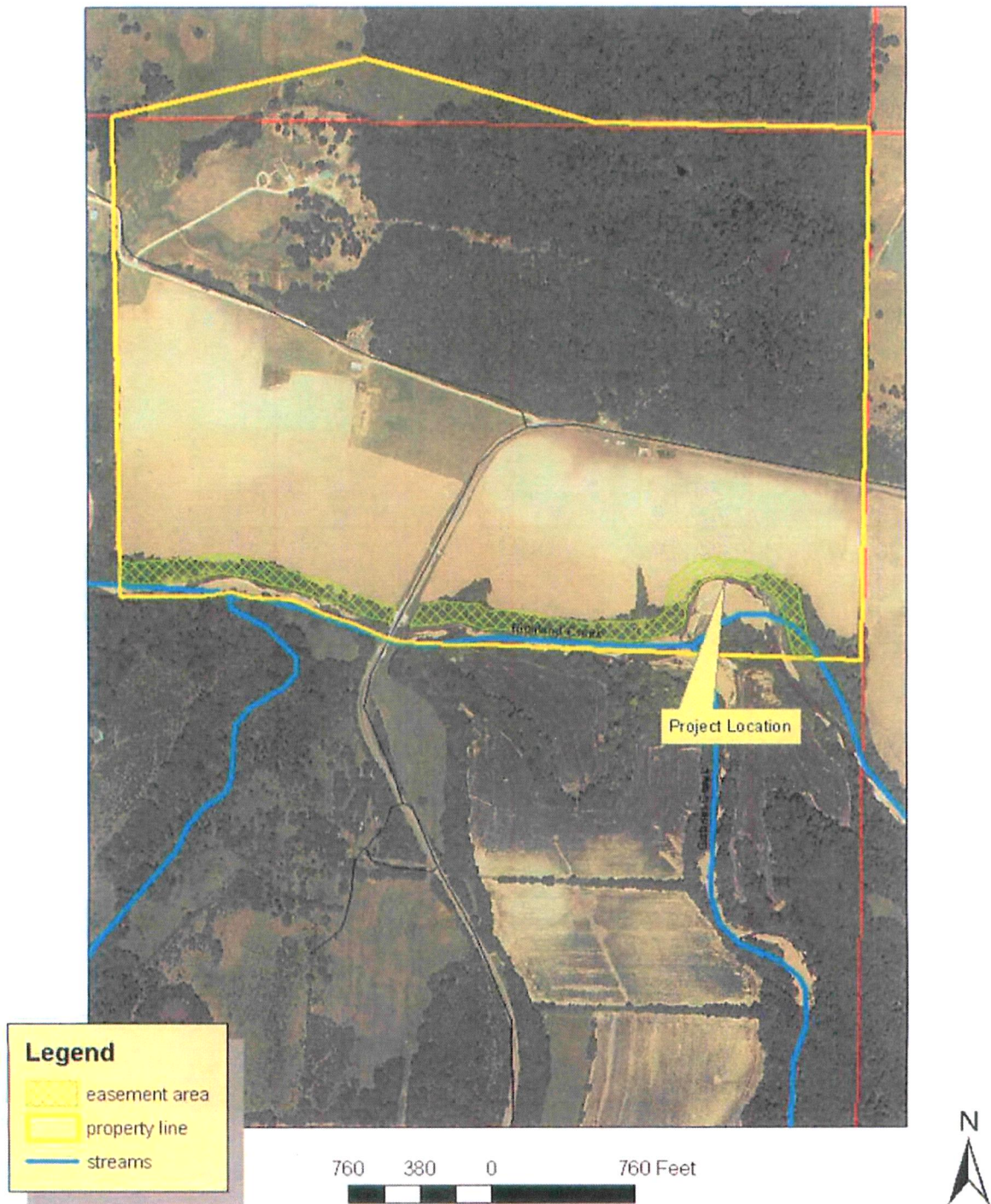
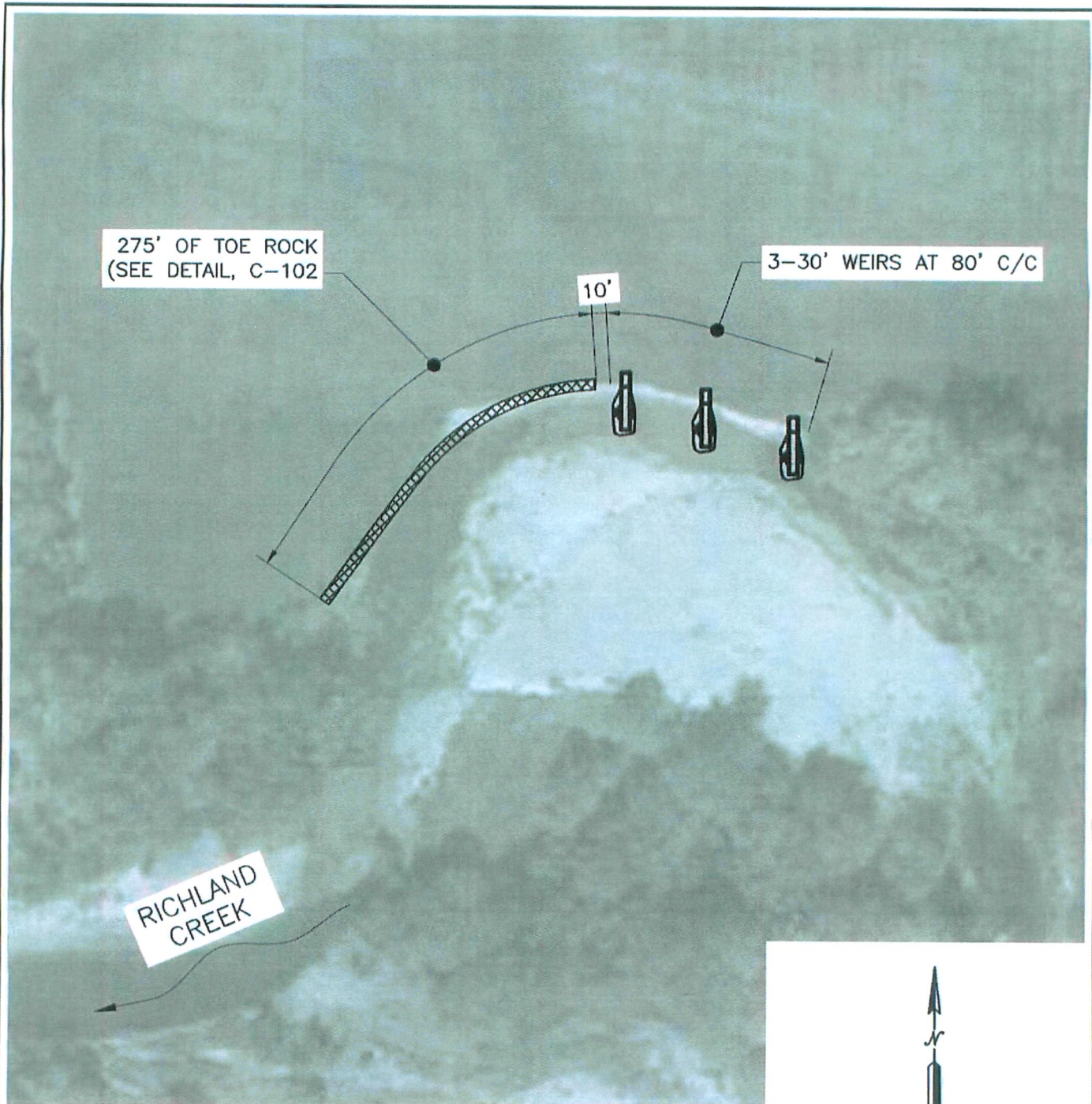




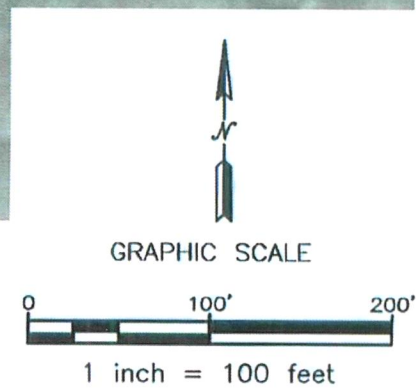
Figure 4: Richland Creek Easement Area and Project Location






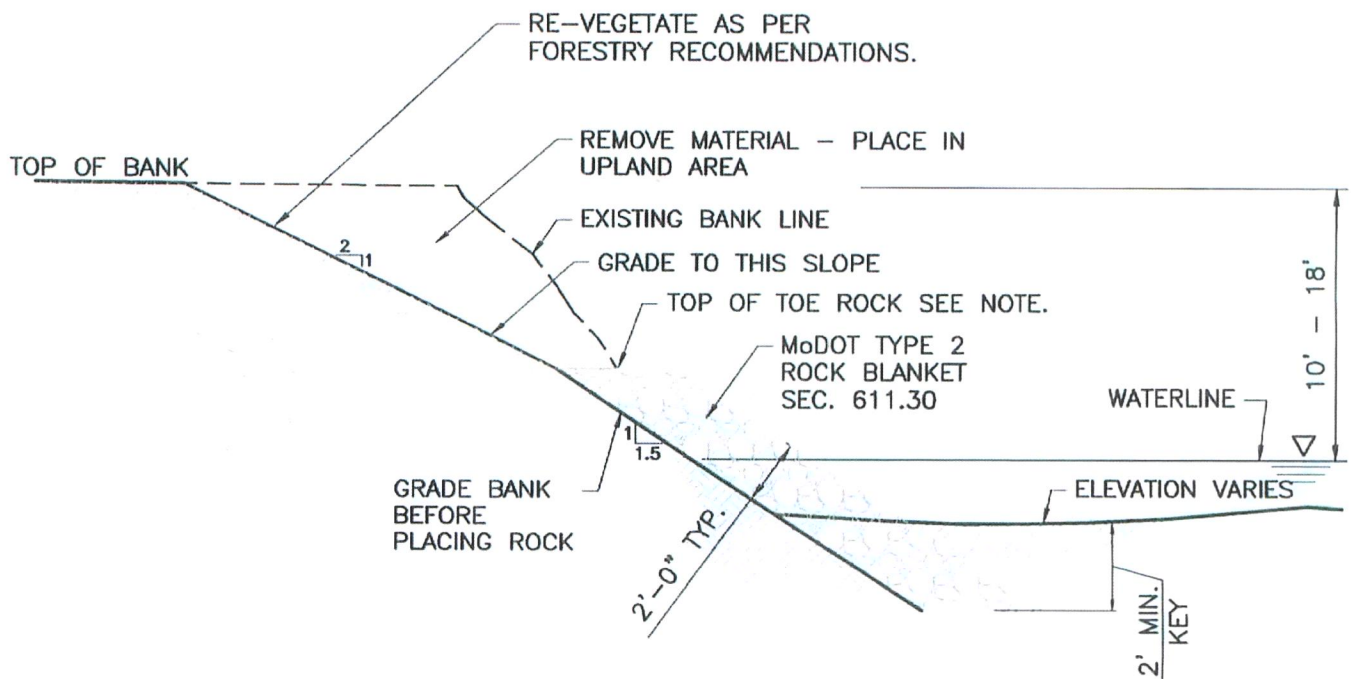


**1 SITE PLAN**  
SCALE: 1" = 100'



<b>CENTRAL REGION PRIVATE LAND - GENERAL</b>  <b>STREAMBANK STABILIZATION</b> <small>in R.R. Right-of-Way</small> <b>PRELIMINARY</b>		 <b>DESIGN AND DEVELOPMENT</b> <b>MISSOURI DEPARTMENT OF CONSERVATION</b> <small>P.O. BOX 180, JEFFERSON CITY, MO 65102 (573) 522-4115</small>	<b>SITE PLAN</b> PROJECT NO. <b>42-43-00</b> <b>C-101</b>	
DATE <u>10/06/11</u> DRAWN <u>HDL</u>	DESIGN <u>LAM</u> CHECKED _____		SHEET <b>2</b> OF <b>5</b>	

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# 1 TOE - ROCK SECTION

SCALE: NTS

## NOTE:

TOP OF TOE ROCK TO BE FIELD SET AT 2.5' TO 3.0' ABOVE BASE FLOW, AS DETERMINED BY ENGINEER AT THE TIME OF CONSTRUCTION.

CENTRAL REGION PRIVATE  
LAND - GENERAL

STREAMBANK STABILIZATION

PRELIMINARY

DATE

DESIGN

LAM

DRAWN RDI

CHECKED



DESIGN AND DEVELOPMENT

MISSOURI DEPARTMENT OF CONSERVATION

P.O. BOX 160, JEFFERSON CITY, MO 65102 (573) 522-4115

TOE - ROCK SECTION

PROJECT NO.

42-43-00

C-102

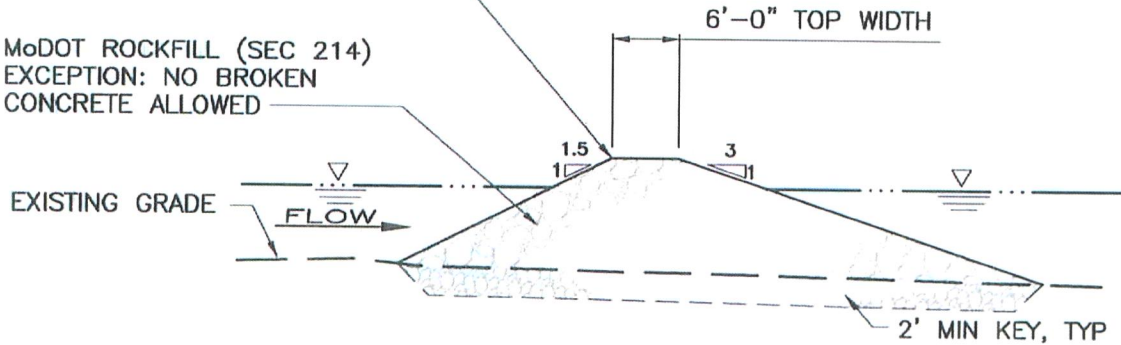
SHEET 3

OF 5



TOP OF WEIR EL. SET AT 1.5'  
TO 2.0' ABOVE BASE FLOW AS  
DETERMINED BY ENGINEER AT  
TIME OF CONSTRUCTION

MoDOT ROCKFILL (SEC 214)  
EXCEPTION: NO BROKEN  
CONCRETE ALLOWED



1

## BENDWAY WEIR - SECTION

SCALE: NTS

### QUANTITIES

	TYPE	CU YDS	TONS
TOE ROCK 275 LF	MoDOT TYPE 2 ROCK BLANKET	305 CY	457 TONS
3 - 30' WEIRS	MoDOT TYPE 2 ROCK BLANKET	350 CY	531 TONS
TOTAL MoDOT TYPE 2 ROCK BLANKET		655 CY	988 TONS
EXCAVATED SOIL FROM BANK TO BE BACKCAST INTO HIGH AREA OF ADJACENT FIELD		400 CY	N/A

CENTRAL REGION PRIVATE  
LAND - GENERAL

STREAMBANK STABILIZATION

PRELIMINARY

DATE \_\_\_\_\_ DESIGN LAM  
DRAWN BDI CHECKED \_\_\_\_\_



DESIGN AND DEVELOPMENT

MISSOURI DEPARTMENT OF CONSERVATION

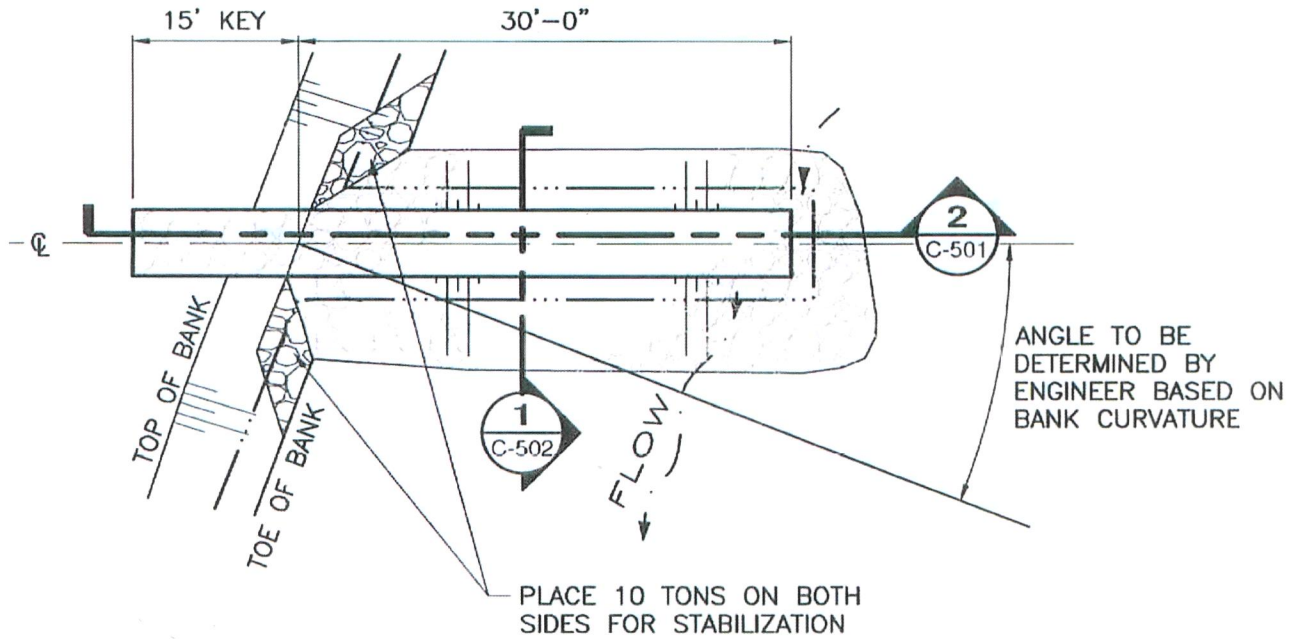
P.O. BOX 180, JEFFERSON CITY, MO 65102 (573) 522-4115

BENDWAY WEIR DETAILS

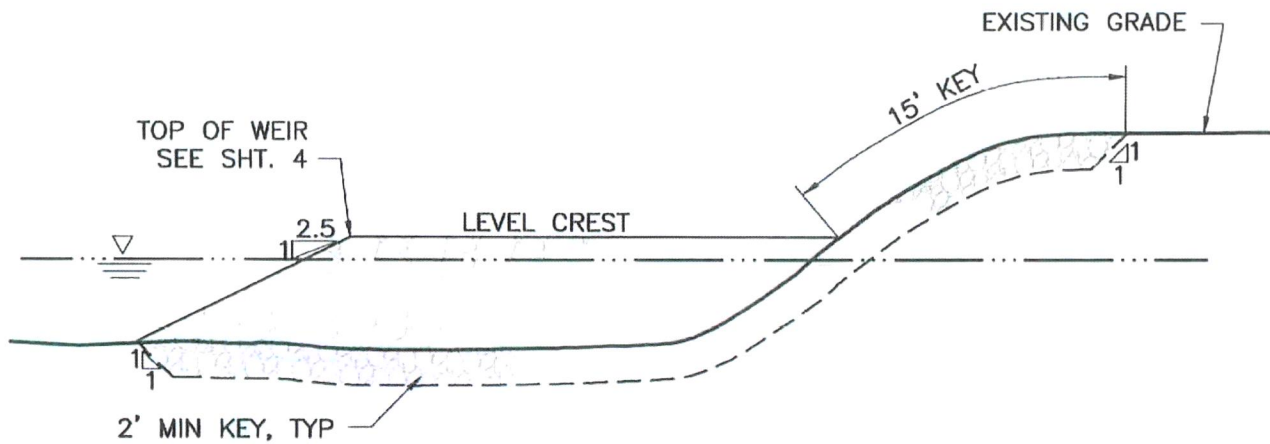
PROJECT NO. **42-43-00**

**C-501**


SHEET **4** OF **5**



**1 BENDWAY WEIR - PLAN**  
SCALE: NTS



**2 BENDWAY WEIR - PROFILE**  
SCALE: NTS

<b>CENTRAL REGION PRIVATE LAND - GENERAL</b>  <b>STREAMBANK STABILIZATION</b>  PRELIMINARY DATE _____ DESIGN LAM DRAWN RDI CHECKED _____		 <b>DESIGN AND DEVELOPMENT</b> MISSOURI DEPARTMENT OF CONSERVATION P.O. BOX 160, JEFFERSON CITY, MO 65102 (573) 522-4115	<b>BENDWAY WEIR DETAILS &amp; QUANTITIES</b> PROJECT NO. <b>42-43-00</b> <b>C-502</b> SHEET 5 OF 5
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